Fire Retarded Foam Flammability Consortium
Statement of Work

OBJECTIVE The objective is to develop high throughput foam preparation methods and quantitative flammability measurement methods to aid polyurethane manufacturers and additive suppliers in developing fire safe foams that are environmentally safe and cost effective. The primary outcome of this work being the creation of a structure-flammability property database for polyurethane foams.

APPROACH Two parallel efforts will be undertaken; a lab-scale foam fabrication facility will be built for the preparation of flexible polyurethane foams and high throughput (HT) quantitative flammability measurement methods for foam will also be developed. During the first year of the effort the primary focus will be on the procurement and set-up of the equipment and the preparation of homogeneous and gradient polyurethane foam samples. An initial set of foams will be prepared that will have a limited set of characteristics varied, e.g. one or two of the following type of flame retardant, level of flame retardant, density, surfactant, etc. In parallel, new flammability characterization approaches will be evaluated, such as the melt-drip flammability apparatus, and the gradient flame-spread method. These methods will be evaluated for their ability to determine the controlling physical and material parameters associated with foam flammability. Polyurethane foam has complex chemical and physical behaviors, and it will require a substantial effort to thoroughly characterize the overall degradation/gasification chemistry and flow rheology. In year 2 these bench-scale measurements will be compared with medium-scale fire tests for exploratory foam composition assessment purposes. The medium-scale tests will focus on fire spread over horizontal and vertical foam slabs in the absence, and then in the presence of enclosing fabrics, which are known to influence fire behavior. Also in year 2 a more complete set of foams will be prepared with a larger number of the important characteristics varied, e.g. type of flame retardant, level of flame retardant, surfactant, density, catalyst, polyol type, water content, etc. The specific meetings and deliverables are listed below.

Year 1
Date
03/05 Complete statement of work for foam consortium
04/05 First informational consortium meeting
07/05 Complete initial evaluation of foam flammability test methods
09/05 Prepare control foams using lab-scale facility
11/05 Complete evaluation of physical properties of control foams
12/05 Complete flammability measurements of control foams
02/06 Second consortium meeting
03/06 Deliver preliminary database on foam flammability and Year 1 report
Year 2
03/06 Third consortium meeting
04/06 Prepare more complete set of foams using lab-scale facility
06/06 Complete flammability measurements of foams

07/06 Complete model on melt flow behavior of foams.

11/06 Fourth consortium meeting
12/06 Deliver final database on foam flammability.
03/07 Final consortium meeting
04/07 Complete final report with recommendation for foam flammability testing methods and candidates for fire safe foams.

Consortium Members responsibilities:
Members are invited to attend all meetings and to participate in the lab work at NIST through visits, or for extended interaction as a guest researcher at NIST.

The following is a list of the tasks each organization plans on assisting with.

NIST
NIST will construct a lab-scale foam preparation facility and prepare foams for testing.
NIST will evaluate new foam flammability measurement methods, such as melt-drip method and the flame spread in a gradient flux field.
NIST will hold meetings, write annual and final reports.
NIST will develop and populate database on foam flammability.

Air Products
Air Products will perform mechanical properties testing of foams, and provide research samples of surfactants.

Albemarle
Albemarle will provide research samples of flame retardant chemicals.

Ameribrom
Ameribrom will provide research samples of flame retardant chemicals.

Chestnutridge foam
TBD

Dow
TBD

Foamex
Foamex will perform mechanical properties testing of foam.

Supresta
Supresta will provide research samples of flame retardant chemicals and perform standard foam flammability properties testing.

Duration: The expected duration of this project is 2 years (4/30/05 – 4/30/07), with an option for a one year extension. A review meeting will be held at the end of each year, at which time the members will decide on whether to participate the next year.

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